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EXAMINATION OF THE BLADDER WITH THE
ELECTRIC-LIGHT CYSTOSCOPE.

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REPRINTED FROM THE
TRANSACTIONS OF THE PHILADELPHIA COUNTY MEDICAL SOCIETY,
NOVEMBER, 1891.

EXAMINATION OF THE BLADDER WITH THE ELECTRIC-LIGHT CYSTOSCOPE.

By JOHN B. DEAVER, M.D.,

[Read November 11, 1891.]

My remarks on cystoscopy will embrace first, exhibition and description of the instrument I use and believe to be best, namely "The Leiter Incandescent-light Cystoscope."

Second, the battery I regard the simplest, the least expensive, and which fulfils every purpose. In my office I use a stationary storage battery.

Third. How to use the instrument, and the most favorable position in which to have the patient.

Fourth. Normal appearance of the healthy bladder.

Fifth. The pathological conditions where such an examination is of special value.

The Leiter incandescent-lamp cystoscope consists of three portions, the beak, the shaft, and the ocular end. The beak is a hollow hood fastened to the body or shaft by a screw and has on its upper surface an oval aperture covered in by a rock-crystal plate. The hood, when in position, protects the lamp.

The shaft or body is $7\frac{1}{2}$ inches in length and 22 millimeters in circumference; a tube rests within the body or shaft containing a system of lenses which extends from the window of the prism to the ocular end, and can be lengthened like the tube of a microscope, increasing the size of the image presented to the prism.

The elbow is furnished with a prism to reflect entering rays of light directed along the central tube to the observer's eye.

These instruments have the window and lamp on the concavity. There is another form where the window and the lamp are placed on the convexity; still this instrument answers all practical purposes as it can be rotated.

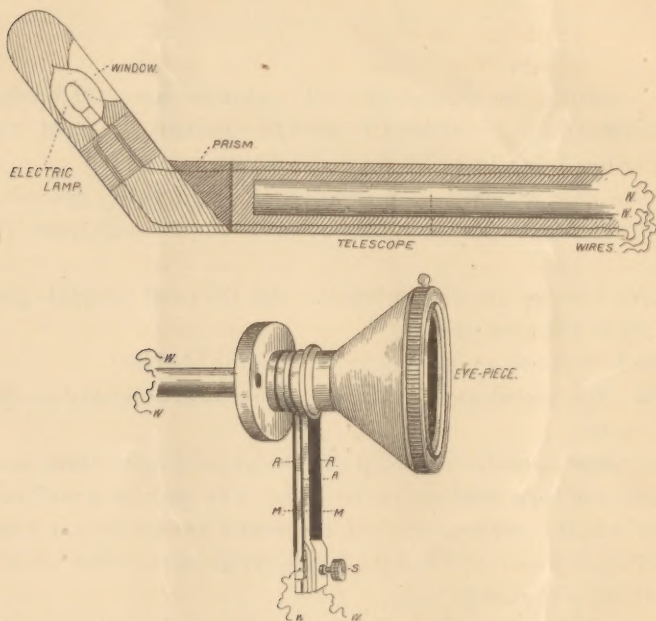


To the distal end of the shaft a small incandescent lamp is attached by means of the terminals which fit into two sockets; these are in direct communication with the battery by means of insulated surfaces.

The manner by which the lamp is placed in position makes it easy to remove when the carbon is burned out. The hood is unscrewed, the lamp lifted out of the sockets by a pair of forceps or the fingers, the new lamp fitted in position in the same manner, and the hood replaced.

At the junction of the shaft and ocular portions there is a holder containing the two binding posts to connect the cords with the battery,

FIG. 1.



a, Rubber insulators; *m*, metal plates; *w*, connecting wires; *s*, screw closing circuit.

also a small knob upon the ocular end to show the position held by the cystoscope in the bladder.

The improved cystoscope is essentially the same as the original with the exception of the holder. This contains the binding posts to connect it with the battery and the cut-off key, which is manipulated by means of a screw instead of a kick-over, which is used in the original instrument. The holder allows rotation of the instrument without changing the position of the hand. It also permits the current from travelling behind it by means of an ebonite or rubber insulation.

This is not present in the original instrument, therefore disagreeable electric shocks are sometimes received by the observer.

The objections to the use of the cystoscope are: first, the danger of burning the mucous membrane, as the lamp becomes hot quickly if it is allowed to burn in air instead of immersed in water; it becomes warm in four seconds, unbearable in ten seconds, and scorching the skin often in fifteen seconds. This can be avoided, however, by immersing the beak in water, when it can be touched with impunity, the heat being rapidly absorbed. This occurs in the bladder, the heat being carried off by the medium contained therein, either urine or water.

It is the rule in electric cystoscopy that the bladder must contain from four to six ounces of urine or water, the greater the distention of the bladder the more satisfactory will be the examination, the comfort of the patient being considered. Even though the bladder contain a sufficient quantity of the fluid medium and the beak of the instrument is brought in contact with the bladder-wall for any length of time, scorching of the mucous membrane will take place.

The second objection that may be raised against the use of the instrument is the danger of the lamp breaking upon contact of the heated hood with the medium. Should this accident occur the bladder would not be exposed as the lamp would still be enclosed in the metal hood, the opening of which is covered by an unbreakable plate of rock crystal.

In cases where the prostate gland is irregularly enlarged it may be difficult if not impossible to make a satisfactory cystoscopic examination, as the instrument cannot be made to engage properly in the bladder. Where the urethra is the seat of stricture, the calibre of which is less than twenty-two millimetres, it goes without saying, that the cystoscope cannot be introduced until the calibre of the urethra at this point is raised to that of the size of the instrument; where the meatus is contracted it will call for enlargement.

Where the urine contains pus or blood, the walls of the bladder cannot be clearly made out. This can generally be overcome, however, by washing out the bladder thoroughly and injecting boric-acid solution.

Where the bladder is contracted it is difficult to manipulate the cystoscope satisfactorily. Some cases of irritable bladder will not tolerate a sufficient amount of urine or water to permit of an examination. Here an injection of cocaine can be used to overcome the difficulty. The other conditions for the successful manipulation of the cystoscope are:

Before arranging the patient for the examination, it should be the rule to see that the lamp and the battery are in working order. Connect the cystoscope with the battery, turn on the current with the rheostat at 0. Now gradually increase or diminish the resistance by means of the rheostat until the lamp burns with a bright white light. The lamp not working satisfactorily it will be necessary to change it before the examination can take place.

As the carbon filaments in the lamp vary, it will be necessary to gauge the resistance offered by the carbon by means of the rheostat. In those lamps where the resistance offered by the carbon is slight the lamp will burn only when the rheostat is at the maximum, and in those where the carbon offers greater resistance the lamp will only burn when the rheostat stands at the minimum.

The Grenet or plunge battery, which I prefer to use outside of my office, is made by Mr. Flemming, of Philadelphia, and consists of a box containing two equal compartments; the first of which is occupied by a series of rubber cells, one-half filled with the following solution: Potassium bichromate, 6 ounces; sulphuric acid, 5 fluidounces; water, 3 pints. This solution must be renewed every two or four weeks, according to usage. The second compartment contains one large cell, the object of which is to catch the drip from the plates after their removal from the bichromate bath, and also to protect them.

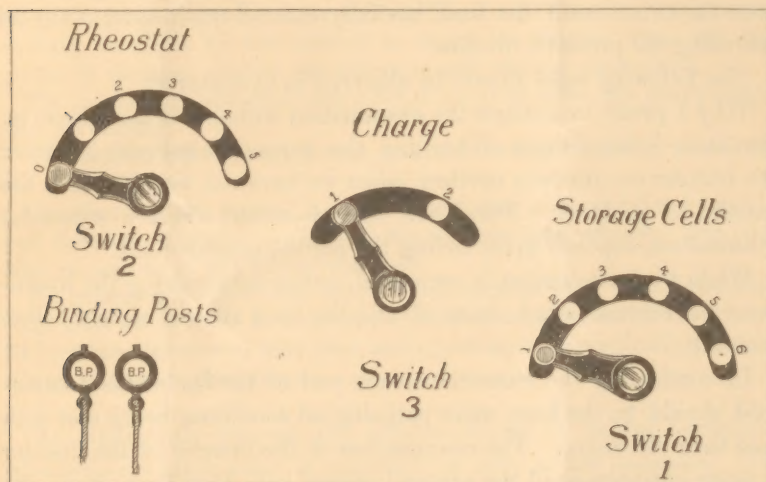
The two compartments are covered by a bed, the under surface of which is divided into two equal parts, one-half being covered by a sheet of rubber, to close the cells when not in use, and the other half occupied by a number of sets of plates. Each set is composed of two carbon and one zinc plate, which are fastened to the bed in the usual manner, and so connected as to have independent action, the number of cells being thrown into circuit as required. After using the battery and wishing to discontinue the current it is merely necessary to lift out the plates, change sides, and deposit them in the one large compartment.

Upon the upper surface of the bed are a number of binding posts corresponding to the number of cells employed, and by attaching the cords in a proper manner the number of cells desired can be brought into circuit. On this surface there is also a rheostat consisting of a rubber plate wrapped with silver wire, connected with the cells and having a swinging arm which can be moved to any part of the plate; the object of the rheostat I will speak of later.

For office use a storage battery is probably the best, as it has in its favor cleanliness, all the cells being placed in the cellar, and these

requiring but little attention. The cost is the only objection which which can be raised against it. The battery plant I use in my office consists of five Gibson storage cells connected with the switch-board, so that the cells may be added one at a time; also sixteen gravity cells, which are connected with the switch-board and are connected through a separate switch.

FIG. 2.



The switch-board was designed by Dr. Brinkmann, a diagram of which will be seen on the blackboard.

When using the storage battery for cystoscopic work the switch No. 1 is carried to point 3, which represents six volts; switch No. 2—the rheostat—is then carried over until the lamp burns with a white light.

During the time that this battery is not in use the storage cells should be charging. This is accomplished by moving switch No. 3 to point 2, thus bringing the terminals of the constant cells in contact with those of the storage cells.

Two binding-posts are placed at the lower corner for the cords to transmit the current to the cystoscope.

The rheostat consists of a number of independent coils of wire, so that as the current is made to pass through them it increases the resistance.

The examination may be performed with or without a local or general anæsthetic. I think the latter is preferable, for reasons stated further on. The best position for examination is that used in lateral or median perineal lithotomy. If the bladder has been recently examined, or if pus or blood be present in the urine, it must be

withdrawn, and the bladder washed out thoroughly through an ordinary catheter with a boric-acid solution until the fluid runs clear. The bladder being now thoroughly clean, from four to six ounces of boric-acid solution are thrown in, and, if necessary, a drachm or more of a four per cent. solution of cocaine also injected into the bladder. The catheter is then withdrawn and the cystoscope introduced, previously smeared with a few drops of glycerin. Care should be taken not to turn the switch until the beak has fully entered the bladder, to avoid scorching the prostatic urethra.

The following rules should be observed in cystoscopy :

Why I prefer to conduct the examination without an anæsthetic is, that there is less danger of burning the mucous membrane of either the bladder or prostatic urethra, when we have the sensations of the patient to guide us. There are cases, however, where a successful examination depends upon having the patient anæsthetized.

When the examination is completed, before withdrawing the instrument the current is to be shut off and the hood allowed to cool before removal.

In conducting the examination the part of the bladder first examined should be the base, more pathological conditions being met with here than elsewhere. The examination of the interior of the bladder is never complete until the ureteral orifices have been seen.

The mucous membrane of a healthy bladder presents a reddish-yellow or light-straw color with a glistening surface. A few vessels will also be seen.

The object of having the bladder well distended is to be able to see the orifices of the ureters, otherwise they may be concealed by folds of the mucous membrane.

With the orifices of the ureters in the field of vision, the escape of the urine which takes place in the jets can be readily seen. The escape of blood or pus from the ureter can also be seen.

I would not advise the use of the instrument in all bladder cases by any means; on the contrary, I regard it as playful to examine cases where the diagnosis can certainly be made by other means.

I believe the greatest field for the examination of the bladder with the electric-light cystoscope is, in obscure cases of hæmaturia, where, without this instrument, it is absolutely impossible to differentiate between renal and vesical hæmaturia by an examination of the urine of the bladder with the searcher and by the finger in the rectum, coupled with any additional light that may be thrown upon the case by a familiarity with its history.

I will relate the history of a case in point :

W. R. was admitted to the medical wards of the German Hospital suffering from hæmaturia. It was thought that his trouble was a surgical affection, and he was therefore referred to me for a cystoscopic examination.

The patient complained of pain referred to the right loin, which at times radiated down to the line of the ureter. He had lost flesh progressively for the past two months. The urine had contained blood for some little time. Examination of the loin revealed nothing abnormal. The bladder was washed out and injected with six ounces of boric-acid solution ; this quantity exciting tenesmus, he was allowed to empty the bladder, when but four ounces of the same solution was thrown in and retained comfortably.

The instrument, lubricated with a few drops of glycerin, was gently passed into the bladder.

The medium was thoroughly clear, and there was no difficulty to map out the relations.

On observing the ureters, it was observed that a gush of blood made its exit from the right side, to which all the pain had been referred. The diagnosis of sarcoma of the kidney was made.

He presented himself some three or four months later, when there was a large mass which could be both seen and felt in the region of the kidney. The patient died several days later, and a post-mortem examination revealed a large sarcoma of the kidney.

To distinguish between the different forms of vesical hæmaturia cystoscopic examination is required in only a few instances. The most common cause for vesical hæmaturia is one or other form of malignant growth ; here the diagnosis can usually be made by the means already well known to us. There is a variety of hæmaturia always associated with cystitis, which, if it does not yield readily to treatment, suggests something more serious. I will direct special attention to this form, as well as to the value of a cystoscopic examination in the diagnosis of it. Some authorities describe it under the name of hemorrhagic cystitis. One of its causes is the complete evacuation, by means of a catheter, of a greatly distended bladder the seat of cystitis. Under these circumstances, the pressure being removed from the bloodvessel walls suddenly, hemorrhage is a consequence. It may also result from the presence of a foreign body which has excited ulceration, from an enlarged prostate, etc.

We meet with cases of vesical hæmaturia when a cystoscopic examination shows nothing more than a cystitis, yet it will not yield to treatment. This is, to say the least, suggestive. I recall one such case, the history of which I will relate :

The patient, a man, forty-two years of age, had suffered from cystitis for some months previously to coming under my care. The urine was never free

from blood, and at times contained a considerable amount. Examination showed nothing other than a subacute inflammation of the mucous membrane. Treatment, which was prolonged, was of no avail. Finally I advised, and subsequently performed, a median perineal cystotomy, to determine first if there was any obscure pathological condition sufficiently far advanced to account for the trouble; and, secondly, with the hope that a cure might be thus brought about. The only additional light thrown on the case by the operation was the presence of questionable nodular points here and there. This patient has gone from bad to worse, until I now believe the trouble to be carcinoma.

FOREIGN BODIES IN THE BLADDER.—A cystoscopic examination should be made in those cases of foreign bodies introduced from without into the bladder where the history is unreliable, granting of course a diagnosis cannot be made by other means. Again we meet with cases where the patient, who is the subject of a catheter life, believes, yet is not positive, that a piece of the instrument is in his bladder from some mishap occurring either in its passage or upon its withdrawal. Ordinarily I admit that such an examination is not only not necessary but meddlesome interference. Here the question arises, How are we to obtain our experience to make us cystoscopists? In such cases when the examination is not called for to make the diagnosis, and where we operate for its removal, in the event it cannot be extricated through the natural outlet, after the patient has been etherized, look into the bladder and locate the body. Observing the precautions mentioned in the early part of my remarks, trouble cannot arise, nor do we complicate the operative procedure by such an examination.

In foreign bodies formed as a result of a pathological process, including growths, stones, etc., the instrument has a limited field, but its use here will be discussed under their respective heads.

STONE IN THE BLADDER.—There are a few cases of vesical calculi where a cystoscopic examination is required to reveal their presence, yet it has a limited field here. One class of cases is where we have examined the bladder for stone and believe we have found one and at a second examination fail. It is the practice of surgeons, having found a stone in the bladder at a previous examination, and now being prepared to operate, when under ether to explore again, and if the stone cannot be found not to operate. In such cases the cystoscope should be used. Another class is where litholapaxy has been done and in the course of a few days the symptoms make both patient and surgeon doubtful as to whether there has been a fragment left which the sound has not been able to detect.

Encysted stone, particularly if small and cannot be detected by other means, the cystoscope will aid us in clearing up the diagnosis.

I will relate the history of a case of stone in the bladder occurring in a patient of my friend, Dr. James Anders, of this city, where a careful cystoscopic examination after either of the first two operations, three in all having been performed for recurring stones, would have revealed that which subsequently proved to be the nucleus of each of these stones. The patient, a female, had sometime previous to the first operation for stone an ovarian tumor removed. The ligature, or at any rate one of the ligatures employed in treating the ovarian pedicle, had ulcerated through the bladder-wall to the mucous coat, where it not only became imbedded, but projected as well, thus exciting acute cystitis which resulted in the deposition of calcareous material to the extent of producing a considerable sized stone. The operation performed each time was that of litholapaxy. At the end of the second operation digital exploration of the bladder showed a projection from the right lateral aspect of the posterior wall, when gentle attempts to remove it failed.

At the end of the third operation, feeling it imperative to get rid of this foreign body if still present to insure the patient against the formation of another stone, the bladder was again explored digitally, and a foreign body detected and removed after considerable difficulty: it proved to be a ligature. Since the last operation, now over three years, the patient has remained well. The interval between the formation of the stones was but six months, therefore, it is fair to infer that the trouble will not recur.

ULCERATION.—In cases of vesical hæmaturia where the cystoscope shows the presence of one or more ulcers not associated with a growth or foreign body, the testicles, spermatic cords, and prostate being free from nodular masses, the most probable cause for such is either tuberculosis or scrofula. The history of the case, a careful examination of the chest, the appearance of the patient, the presence of glandular enlargement, etc., may assist materially in forming an opinion.

GROWTHS.—In growths of the bladder the instrument is of inestimable value. No longer will we, as was formerly the practice, advise a cutting operation where we are in doubt as to the presence of such, but will settle this definitely by making a cystoscopic examination. Here too, I grant, we meet with cases of malignant growth where it is not necessary to make such an examination, the diagnosis being readily made without it. In papilloma, which by no means has hæmaturia associated with it in all instances, the instrument serves

first to determine the nature of the growth, if it is not already known, and second its situation and extent of attachment, thus guiding the surgeon in the selection of the operation to be done for its removal.

With the bladder as with other organs it should not be cut into for obscure trouble for the purpose of making a diagnosis until all other justifiable measures have been exhausted with negative results.

